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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/676,422	09/29/2000	Douglas N. Kimelman	YOR920000293US1	5708

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EXAMINER	
ALI, SYED J	

ART UNIT	PAPER NUMBER
2127	9

DATE MAILED: 05/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/676,422	KIMELMAN ET AL.
	Examiner	Art Unit
	Syed J Ali	2127

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to the amendment filed March 15, 2004. Claims 1-28 are presented for examination.

2. The text of those sections of Title 35, U.S. code not included in this office action can be found in a prior office action.

3. The cross reference related to the application cited in the specification must be updated (i.e. update the relevant status, with PTO serial numbers or patent numbers where appropriate, on page 1, lines 5-13; page 13 lines 1-16). The entire specification should be so revised.

Claim Rejections - 35 USC § 103

4. **Claims 1-7, 9-17, 21-25, and 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt (cited in previous office action) in view of Ibe et al. (USPN 6,437,804) (hereinafter Ibe).**

5. As per claim 1, Hunt teaches the invention substantially as claimed, including a task management method for determining optimal placement of task components, said method comprising:

a) generating a communication graph representative of a task (col. 23 lines 13-23);

c) determining a min cut for the communication graph (col. 24 lines 8-28); and

d) placing task components responsive to said min cut determined for the communication graph (col. 23 lines 13-23)..

6. Ibe teaches the invention as claimed, including the following limitations not shown by Hunt:

b) identifying independent nets in said communication graph (col. 8 line 31 - col. 9 line 32).

7. It would have been obvious to one of ordinary skill in the art to combine Hunt with Ibe since the method of cutting a graph as depicted by Hunt suffers the drawback of having relative inflexibility in terms of the partitioning algorithm used. Ibe provides multiple partitioning algorithms that seek to produce independent graphs that reduce bottlenecks. Ibe introduces the concept of anchor nodes that serve as a base node for a cluster, which allow for partitioning the network in a manner that eliminates weak links of communication, thereby improving the communication across clusters (independent nets). Although it is noted that Ibe is mostly described within a network communication topology, the application is not limited to this. Any system that can be represented as a group of nodes and edges, including task components as shown by Hunt, can make use of the partitioning algorithm taught by Ibe (col. 5 lines 26-30). Thus, the combination of partitioning performed by Hunt and Ibe would allow task components to be optimally distributed across various system components, while eliminating communication (or inter-process communication) bottlenecks, such that overall system performance is greatly improved.

8. As per claim 2, Hunt teaches the invention as claimed, including a task management method as in claim 1, wherein the communication graph generated in step (a) comprises:

task components represented as nodes of said communication graph (col. 24 lines 8-28); and

edges connecting ones of said nodes representing communication between connected nodes (col. 24 lines 8-28).

9. As per claim 3, Hunt teaches the invention as claimed, including a task management method as in claim 2, after the step (a) of generating a communication graph, further comprising the steps of:

a1) weighting edges, said edges being weighted proportional to communication between connected nodes (col. 24 lines 8-28); and

a2) assigning terminal nodes, task components being placed on said terminal nodes in the task placing step (d) (col. 24 lines 8-28).

10. As per claim 4, Ibe teaches the invention as claimed, including a task management method as in claim 3, wherein the step (b) of identifying independent nets comprises the steps of:

i) selecting a seed node for an independent net (col. 9 line 23 - col. 13 line 40);

ii) identifying nodes adjacent to said seed node as perimeter nodes belonging to said independent net, perimeter nodes being an outer perimeter of nodes identified as belonging to said independent net (col. 9 line 23 - col. 13 line 40);

iii) identifying nodes adjacent to said perimeter nodes as belonging to said independent net, said identified adjacent nodes being identified as perimeter nodes (col. 9 line 23 - col. 13 line 40); and

iv) repeating step (iii) until all perimeter nodes are terminal nodes (col. 9 line 23 - col. 13 line 40).

11. As per claim 5, Ibe teaches the invention as claimed, including the following limitations not shown by the modified Hunt:

a task management method as in claim 4, wherein before the step (i) of selecting a seed node, all nodes not being terminal nodes are marked as unvisited nodes (col. 9 line 50 - col. 11 line 33).

12. As per claim 6, Ibe teaches the invention as claimed, including the following limitations not shown by the modified Hunt:

a task management method as in claim 5, wherein in step (i) the seed node is marked as visited and perimeter nodes are marked as visited in steps (ii) and (iii) (col. 9 line 50 - col. 11 line 33).

13. As per claim 7, Ibe teaches the invention as claimed, including the following limitations not shown by the modified Hunt:

a task management method as in claim 6, wherein all nodes marked as visited in steps (i) - (iv) identify an independent net, said method further comprising the steps of:

v) checking said communication graph for unvisited nodes (col. 9 line 50 - col. 11 line 33); and

vi) repeating step (i) - (v) whenever unvisited nodes remain in said communication graph (col. 9 line 50 - col. 11 line 33).

14. As per claim 9, Hunt teaches the invention as claimed, including a task management method as in claim 3, wherein each said task component is a unit of the computer program (col. 24 lines 8-28).

15. As per claim 10, Hunt teaches the invention as claimed, including a task management method as in claim 9, wherein said each computer program unit is an instance of an object in an object-oriented program (col. 1 lines 36-55).

16. As per claim 11, Hunt teaches the invention as claimed, including a task management method as in claim 9, wherein in step (d) computer program units are placed on computers, computer program units being placed on a common computer being combined into a single component (col. 24 lines 42-48).

17. As per claim 12, Hunt teaches the invention substantially as claimed, including a distributed processing system for determining optimal placement of computer program components on multiple computers, said distributed processing system comprising:

means for generating a communication graph representative of a computer program (col. 23 lines 13-23);

means for determining a min cut for the communication graph (col. 24 lines 8-28);

means for placing program components on ones of multiple independent computers responsive to said min cut determined for the communication graph (col. 23 lines 13-23); and

said computer program being executed by said multiple independent computers (Figs 1-2).

18. Ibe teaches the invention as claimed, including the following limitations not shown by Hunt:

means for identifying independent nets in said communication graph (col. 8 line 31 - col. 9 line 32).

19. As per claim 13, Hunt teaches the invention as claimed, including a distributed processing system as in claim 12, wherein the communication graph comprises:

a plurality of nodes, each of said plurality of nodes representing one of said program components (col. 24 lines 8-28); and

a plurality of edges connecting ones of said nodes, each of said edges representing communication between connected nodes (col. 24 lines 8-28).

20. As per claim 14, Hunt teaches the invention as claimed, including a distributed processing system as in claim 13, further comprising:

weighting means for weighting said edges proportional to communication between connected said nodes (col. 24 lines 8-28).

21. As per claim 15, Ibe teaches the invention as claimed, including a distributed processing system as in claim 14, wherein the means for identifying independent nets comprises:

means for selecting a seed node amongst the nodes of said communication graph (col. 9 line 23 - col. 13 line 40); and

means for branching out from said seed node and identifying perimeter nodes adjacent (col. 9 line 23 - col. 13 line 40).

22. As per claim 16, Ibe teaches the invention as claimed, including the following limitations not shown by the modified Hunt:

a distributed processing system as in claim 15, further comprising means for marking nodes as unvisited nodes (col. 9 line 50 - col. 11 line 33).

23. As per claim 17, Ibe teaches the invention as claimed, including a distributed processing system as in claim 16, wherein the marking means marks each perimeter node as visited, when all nodes in said communication graph are marked as visited all independent nets have been identified in said communication graph (col. 9 line 50 - col. 11 line 33).

24. As per claims 21-25 and 27-28, Hunt teaches the invention substantially as claimed, including a computer program product for partitioning a graph, said computer program product

comprising a computer usable medium having computer readable program code thereon, said computer readable program code implementing the method of claims 1-7, and 9-11, respectively (Fig. 2). The remainder of the limitations presented in claims 21-23 and 27-28 are similar to those found in claims 1-7 and 9-11, respectively.

25. **Claims 8, 18-20 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt in view of Ibe in view of Padberg et al. (cited by Applicant in IDS filed Jan. 3, 2001) (hereinafter Padberg).**

26. As per claim 8, Padberg teaches the invention as claimed, including the following limitations not shown by Hunt or Ibe:

a task management method as in claim 3, wherein the step (c) of determining a min cut comprises the steps of:

i) listing all independent nets as subgraphs in a subgraph list (pg. 27-30, procedure SETUP);

ii) selecting a subgraph from said subgraph list (pg. 27-30, procedure TEST1);

iii) applying a linear complexity method to said subgraph, if said linear complexity method divides said subgraph into two or more smaller independent nets, listing said smaller independent nets in said subgraph list and returning to step (i) (pg. 27-30, procedure TEST1);

iv) checking whether said subgraph includes two or more smaller independent nets, if said subgraph includes two or more smaller independent nets, identifying and listing said smaller independent nets in said subgraph list and returning to step (i) (pg. 27-30);

v) applying a higher complexity method to said subgraph, said higher complexity method being more complex than said linear complexity method and, if said higher complexity method divides said subgraph into two or more smaller independent nets, listing said smaller independent nets in said subgraph list and returning to said step (i) (pg. 27-30, procedure TEST2);

vi) selectively collapsing an edge to reduce said subgraph, if collapsing said edge divides said subgraph into two or more smaller independent nets, listing said smaller independent nets in said subgraph list and returning to step (i) (pg. 27-30); and

vii) checking whether said subgraph list is empty (pg. 26).

27. It would have been obvious to one of ordinary skill in the art to combine the modified Hunt, Ibe, and Padberg since the procedure for determining a minimum cost cut of a graph is of great importance in terms of attempting to reduce communication time, particularly for network communication. However, many minimum cut procedures can be costly and difficult to implement, potentially negating the benefit gained from finding the minimum cut. Hunt and Ibe both state that partitioning algorithms are particularly difficult to implement for larger graphs with a large number of nodes. The minimum cut procedure of Padberg provides an improvement upon previous minimum cut procedures in that it has the same worst case bound as previous methods, but it easier to implement and has been shown to be more efficient than previous

methods, especially in cases of graphs with a large number of nodes (see pages 31-35 for computational results).

28. As per claim 18, Padberg teaches the invention as claimed, including the following limitations not shown by Hunt or Ibe:

a distributed processing system as in claim 17, wherein the means for determining a min cut comprises:

means for maintaining a list of all independent nets (pg. 27-30, procedure SETUP);

linear complexity reduction means for selectively reducing listed independent nets (pg. 27-30, procedure TEST1);

higher complexity reduction means for selectively reducing listed independent nets using a method having higher complexity than used by said linear complexity means (pg. 27-30, procedure TEST2);

means for selectively collapsing independent net edges to reduce said listed independent nets (pg. 27-30, procedure SHRINK);

means for checking whether any reduced independent net includes two or more smaller independent nets (pg. 27-30, procedure MIN_CUT); and

means for checking whether said list is empty (pg. 26).

29. As per claim 19, Hunt teaches the invention as claimed, including a distributed processing system as in claim 18, wherein each said program component is a unit of the computer program (col. 24 lines 8-28).

30. As per claim 20, Hunt teaches the invention as claimed, including a distributed processing system as in claim 19, wherein said each program unit is an instance of an object in an object-oriented program (col. 1 lines 36-55).

31. As per claim 26, Hunt teaches the invention as claimed, including a computer program product for partitioning a graph, said computer program product comprising a computer usable medium having computer readable program code thereon, said computer readable program code implementing the method of claim 8 (Fig. 2). The remaining limitations in claim 26 are similar to those found in claim 8.

Response to Amendment

32. On pages 2-3 of the amendment, a replacement paragraph is submitted in an effort to update the status of the relevant copending applications. It appears that there is a typographical error, as the paragraph on page 14, line 1 of the specification does not correspond to the replacement paragraph in the amendment. It is believed that the replacement paragraph was intended to replace the paragraph on page 13, line 1 of the specification.

Response to Arguments

33. Applicant's arguments with respect to claims 1-28 have been considered but are moot in view of the new grounds of rejection.

Conclusion

34. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Syed J Ali whose telephone number is (703) 305-8106. The examiner can normally be reached on Mon-Fri 8-5:30, 2nd Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai T An can be reached on (703) 305-9678. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Syed Ali
April 16, 2004

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